Speech Recognition as AT for Writing: A Guide for K12

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Learning Objectives

1. Describe 8 scaffolded steps to teach students to use speech recognition.

2. Identify at least 3 data collection strategies to measure the effectiveness of speech recognition as AT.

3. Identify at least 3 strategies for successful implementation in the customary environment.
What do you call it?

• Speech-to-text
• Voice recognition
• “Dragon Speak”
• Speech recognition (SR)
Who are we?

• **Kelly Key, BS, MS, CAS, ATAC**
  • Assistive Technology Coordinator for Barrington 220, Barrington, Illinois
  • 14th year in current role
  • Assistant Principal & Special Services Facilitator admin for 13 years
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• **Daniel Cochrane, MA, MS, ATP**
  • Clinical Instructor, University of Illinois at Chicago
  • Assistive Technology Specialist/Coordinator for CUSD200 Wheaton and Warrenville, IL for 13 years full-time, 5 years part-time
  • Special educator for 7 years
  • Former chair of RESNA Professional Standards Board
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Why a guide for K-12?

Speech recognition is universally available. Students can use it whenever they want!
You don’t want this...

hey, come here... check out my new speech recognition program

Pay severe. Chicken manure peach wreck ignition grow ham.

Toothpaste For Dinner.com
SR is still AT for some students...

• If it improves “functional capability of a child with a disability,” it would be documented on IEP...
  • As assistive technology/accommodation
  • Potentially as an accommodation on high-stakes testing
    • PARCC
    • Smarter Balanced
• The team needs data first
SR is still AT for some students...

• AT service obligation
  • Selecting... fitting... applying... AT devices;
  • Training... for child... if appropriate, child’s family;
  • Training... for professionals... or other individuals who provide services to... child.

34 C.F.R. § 300.6
How to Access the Guide

View online at http://bit.ly/srguide

Or download the PDF directly from this screen
Speech recognition shouldn’t be the only tool!

Ira Socol’s Toolbelt Theory http://speedchange.blogspot.com/2008/05/toolbelt-theory-for-everyone.html

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How this guide is organized

Simple AT process:
1. Consider it!
2. Try it!
3. Assess it!
4. Implement it!
Consider it

**AT Feature-matching process**

1. Consider the **task-demands**: What writing tasks are expected? What outcome level?

2. Consider the **student’s performance**: What is gap between current performance and curricular expectations for writing?

3. Consider the **context**: Would SR match the environment?
   - Not so good: Noisy or very quiet classroom, taking notes during a lecture
   - Good: Back of classroom, in study carrel, in resource room, at home
Student’s performance

Ideal student profile
- Difficulty with output demands of writing (transcription)
- Can verbally express thoughts and ideas (expressive language)

Helpful pre-existing skills
- Motivation to use tech for writing
- Consistency of breath, volume, pitch
- Clear enunciation
- Ability to inhibit “uhms” and “ahhs”
- Ability to problem-solve
- Ability to self-monitor
- Ability to tolerate frustration
- Attention to visual details
- Ability to decode or use text-to-speech for editing
Student’s performance

- Motivation to use tech for writing
- Consistency of breath, volume, pitch
- Clear enunciation
- Ability to inhibit “uhms” and “ahhs”
- Ability to problem-solve
- Ability to self-monitor
- Ability to tolerate frustration
- Attention to visual details
- Ability to decode or use text-to-speech for editing

Students can be taught many of these skills!
Consider it

How do you know if speech recognition will work for the student?
You don’t know until you...

Try it!
Try it!

- Many options to choose from
- Many universally available

**Free Options**
- Windows Speech Recognition
- Listening
- Mac OS X Dictation

**Paid Options**
- Dragon NaturallySpeaking Premium
- CO-Writer Universal
- Dragon Dictate
- read&write
- Word2Speak

ASSISTIVE TECHNOLOGY UNIT
Try it!

• The key to trying SR with students is to **TEACH** the **SPEECH RECOGNITION PROCESS**
Try it!

Before you begin...

• Plan to work with the student individually vs. whole group
• Invite someone else to attend the sessions
• Decide what tool to try first
• Set up the technology (Dragon tips available in Appendix!)
• Understand the speech recognition writing process
Decide which technology to try first

|                      | Smartphone/tablet | | Laptop/Desktop | | Pros | Cons | Pros | Cons |
|----------------------|-------------------|---|----------------|---|-------|------|-------|------|-------|
| Portable             | Portable          |   |                |   |       |      | Bigger screen | Not as portable |
| No external mic used | No external mic used |   |                |   |       |      | Easy to pair with other AT | None |
| Cloud-based processing | Cloud-based processing |   |                |   |       |      | Local processing | May need to train |
| Works with multiple apps | Works with multiple apps |   |                |   |       |      | Dictate into familiar apps | None |
| Everyday technology  | Everyday technology |   |                |   |       |      | More voice commands | Distracting? |

Pros: Portable, No external mic used, Cloud-based processing, Works with multiple apps, Everyday technology
Cons: Hard to print, Recognition less accurate, Requires WIFI, Small screen, hard to see, Student may not own a smartphone

Bigger screen, Easy to pair with other AT, Local processing, Dictate into familiar apps, More voice commands
Understand the SR writing process

1. Think about your topic and what you want to write
2. Mentally compose your sentence
3. Hold the sentence in memory
4. Turn on the mic
5. Say your sentence with clear enunciation in a natural speaking manner
6. Turn off the microphone
7. Check the recognition accuracy
8. Fix the recognition errors
1. Think it!
2. Say it!
3. Check it!
4. Fix it!

Included in the downloadable PDF at http://bit.ly/srguide
Speech recognition writing process

Requires the integration of many underlying skills:

- Language
- Generation of ideas
- Short-term memory
- Oral articulation
- Fine motor
- Decoding
- Editing and revising
- Computer operation
Teach it!

Scaffolded Approach

1. Model the process
2. Single sentence
3. Several sentences
4. Simple paragraphs
5. Academic vocabulary
6. Formal paragraphs
7. Academic writing
8. Independent use

Starts on Page 9 in the Guide

Slowly increase the cognitive load as you remove the scaffolding
Quick Reference Sheet

How to Teach the Speech Recognition Writing Process

These steps are scaffolds. They can be expanded or collapsed as needed. How much scaffolding is needed depends on the student.

If you do not know the student, it may help with comfort level and provide content to write about if you have a conversation/interview with the student first.

1. **Model the process** using the program or app from start to finish. Make sure to explicitly model the 4 process steps (Think It, Say It, Check It, Fix It) and all operational steps (i.e. turn on the mic, speak punctuation, etc).

2. Start with a **single sentence** you provide; student fills in with personal information and says the sentence out loud.
   - For example: I live in a ___ (color) house on a ___ (quiet/noisy) street.
   - **Coach enunciation until the sentence is correct.** Have the student repeat this sentence (a few times if needed) on a new line. Do not correct errors. Compare attempts. Coach to improve recognition each time (i.e. adjust mic, voice speed, articulation, positioning, etc.)

3. Have the student **write 3-4 sentences on a personal topic.**
   - **Teach the editing process after each sentence.** Coach the student to visually check the transcribed sentence for recognition accuracy. Consider using a text-to-speech feature to support this.
   - **Teach punctuation.** Students will need practice with this and may need a visual or gestural cue to speak their punctuation or type it after dictation.
   - **Teach a limited number of voice commands** (as needed).

4. Have the student **write and edit 1-2 paragraphs from motivating pictures or personal topics.**
   - Student can talk their ideas out loud first. Model the use of a graphic organizer (i.e. write down key words or phrases the student shares out loud prior to dictating).
   - Continue to coach THINK IT, SAY IT, CHECK IT, FIX IT.

5. Have the student write and edit **5-10 single sentences on an academic topic.** Find a list of grade level vocabulary. Give the student a word from the list that they know and ask them to create a sentence with the word. Encourage the student to expand their sentences as needed. Repeat for 5-10 sentences.

6. Have the student **write multiple paragraphs after completing a graphic organizer.** Have the student write about a topic of interest or an academic topic. The student will use a graphic organizer to organize their ideas, then turn the key words/phrases into full sentences.

7. Have the student **complete a semi-independent assignment** using speech recognition. In between sessions, provide students with an assignment to complete a writing piece (does not have to be a required academic assignment if they are not ready yet). Make sure someone is available to provide support as needed. This can be done at school or home (if SR is available to the student).

8. Have the student **complete an academic writing assignment** independently using the program. Use this sample and future writing samples to collect data.

If speech recognition is effective as AT for writing, implement and monitor effectiveness and regular use over time.

Included in the downloadable PDF at http://bit.ly/srguide
#2. Single sentence you provide

“I live in a ____ house on a ____ street.”

• Ask student for info
• Tell student the full sentence
• Student repeats the full sentence
• Review mic operation (or turn on yourself)
• Student dictates sentence
• Read the transcribed sentence to student (or demonstrate use of text-to-speech)

Tip: Avoid having the student read from a book.
#2. Single sentence you provide (cont.)

- Coach enunciation until the sentence is correct

I live in a new mouse on a riot street.
I live in a blue house on a riot street.
I live in a blue house on a quiet street.
#2. Single sentence you provide (data)

• Data collection tips
  • Observe the student’s ability to:
    • Remember the whole sentence accurately (short-term memory)
    • Change their enunciation as you give feedback
    • Remember the verbal “period” at the end
  • Count
    • Recognition accuracy
      • Goal is at least 80% accuracy
#3. Write 3-4 sentences on personal topic

• Interview student about pets, family, personal interests (beginning of session)

• Review SR writing process (Think It, Say It, Check It, Fix It)

• Apply the SR process to personal topic
#3. Write 3-4 sentences on personal topic (cont.)

- **Think it:** Coach student to practice their sentence out loud before dictation
  - Coach verbal punctuation commands
- **Say it:** Teach strategies (e.g. break long sentence apart)
- **Check it:** Coach careful reading or use of text-to-speech
  - Add punctuation with keyboard
- **Fix it:** Teach strategies (e.g. if most of the sentence is incorrect, erase and start over)
#3. Write 3-4 sentences on personal topic (cont.)

• Teach the editing process after each sentence
  • Visually check the sentence for recognition accuracy or use a TTS program like Snap & Read (at a slower rate) to listen back
  • Make changes as needed using keyboard

• Teach punctuation
  • Provide a gestural cue or visual reminder if needed
  • Remind them they can use the keyboard
  • Model this again if needed

• Teach a limited number of voice commands
#3. Write 3-4 sentences on personal topic (data)

**Data collection tips**

- Observe the student’s ability to:
  - Generate ideas
  - Mentally formulate grammatically correct sentences
  - Use a variety of vocabulary words
  - Create longer sentences in response to coaching
  - Say punctuation or type punctuation when they Check It
  - Level of independence with operational steps

- Count
  - Recognition accuracy (%)
  - Productivity (wpm)
  - Readability score (word and sentence length)
How do you know if SR is not a good match?

If recognition accuracy is below 80%:

1. Have you spent a significant amount of time teaching the skills needed to use SR?
2. Have you tried at least 3 different SR software products? Do any of the products have adjustments or training features to increase accuracy?
3. Have you tried several different microphone setups, including an external mic with noise canceling features?
4. Is the individual significantly frustrated and unmotivated? Do they want to stop using SR?

If yes to all four, then SR is probably not a good match (but don’t give up too soon).
#4. Write & edit 1-2 paragraphs from motivating pictures or personal topics

- Continue to coach the Think it, Say it, Check it, Fix it process
- Gradually fade coaching
- Collect data on independence and writing quality

Speech Recognition Writing Process

1. Think it 🎈
2. Say it 🎧
3. Check it 🎈🎈
4. Fix it ✔
#4. Write & edit 1-2 paragraphs from motivating pictures or personal topics (data)

• **Data collection tips**
  • **Count**
    • Independence of operational steps
    • Independence of SR writing process (Think it, Check it, etc.)
    • Productivity score (wpm)
    • Correct word sequences
    • Readability score
    • Writing rubric score
  • **Student preferences:** This is a good opportunity to collect data on what the student thinks!
    • Ask them to write about the pros/cons of using speech recognition to write.
    • Likert scale response
#5. Write & edit 5-10 sentences using single words from an academic vocabulary list

1. Find a list of academic vocab words
   - Ask classroom teacher for current vocab
   - Search online for grade level list

2. Pick a word the student knows and say...
   “Make a sentence with the word ____.”

3. Repeat for 5-10 sentences.

4. Coach the student throughout as needed.
#5. Write & edit 5-10 sentences using single words from an academic vocabulary list (data)

- **Data collection tips**
  - **Observe**
    - Ability to use academic vocabulary (generate ideas)
    - Ability to mentally form grammatically correct sentences
    - Ability to stretch sentences in response to coaching
  - **Count**
    - Recognition accuracy
    - Readability score (or just sentence length)
    - Correct word sequences
    - Probably would not count productivity
#6. Write multiple paragraphs after completing graphic organizer using key words/phrases

• Help the student identify a topic of interest
• Help student fill out pre-writing organizer
  • Coach student to use key words!
• Coach student to turn key words into full sentences
Importance of teaching key words/phrases

THINK IT: Look at the key phrase on the outline and mentally turn it into a full sentence.

This movie is about a bird named Red who lives on an island.

SAY IT: “This new movie is about a bird named Red who live on an island.”

HERE’S WHAT STUDENTS WILL DO
- computer-animated movie features a bird named Red who lives on an island filled with cheerful, flightless birds (timeforkids.com 2016)
- Unlike the other birds on the island, Red always seems to be angry, having a boat full of mysterious green pigs land on the island. It’s up to Red and his pals, Chuck and Bomb, to find out why. (timeforkids.com 2016)

TEACH KEY WORDS/PHRASES INSTEAD
- bird named Red (timeforkids.com 2016)
- island (timeforkids.com 2016)
- angry (timeforkids.com 2016)
- green pigs arrives (timeforkids.com 2016)
#6. Write multiple paragraphs after completing graphic organizer using key words/phrases

- **Data collection tips**
  - Observe
    - Ability to generate ideas
    - Ability to organize ideas
    - Ability to select 1-2 key words to convey ideas on organizer
  - Count
    - Independence
    - Recognition accuracy
    - Readability score
    - Writing rubric score
    - Probably would not count productivity or CWS (unless machine scored)
#7. Student semi-independently completes a writing assignment using speech recognition

- Use an academic assignment if the student is ready, or topic of choice.
- Complete at school or home with support as needed.
- Could use this step as “homework” between individual sessions

Try it
#7. Student semi-independently completes a writing assignment using speech recognition (data)

**Data collection tips:**

- **Observe**
  - Did they complete the assignment? (if it was homework)
- **Count**
  - Recognition accuracy
  - Writing rubric score
- **Student preferences**
  - Did they like using SR to do the assignment?
#8. Student independently completes an academic writing assignment using speech recognition

- Some students may jump directly to this step from step #3 (3-4 sentences on personal topic)
- If you want observational data, watch the student (no coaching!)
- Teacher grades the assignment using classroom writing rubric (data collection)
- Collect data on the effectiveness of SR as AT for writing (see Assess It)
- Implement & monitor effective use over time.
#8. Student independently completes an academic writing assignment using SR

- Data collection tip:
  - Final outcome writing rubric (post)
  - Ask classroom teacher to score using same rubric for pre-SR writing and post-SR writing samples
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3. Have the student **write 3-4 sentences on a personal topic**. Encourage the student to expand their sentences as needed.
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   - **Teach punctuation**. Students will need practice with this and may need a visual or gestural cue to speak their punctuation or type it after dictation.
   - **Teach a limited number of voice commands** (as needed).

4. Have the student **write and edit 1-2 paragraphs from motivating pictures or personal topics**.
   - Student can talk their ideas out loud first. Model the use of a graphic organizer (i.e., write down keywords or phrases the student shares out loud prior to dictating).
   - Continue to coach THINK IT, SAY IT, CHECK IT, FIX IT.

5. Have the student **write and edit 5-10 single sentences on an academic topic**. Find a list of grade level vocabulary. Give the student a word from the list that they know and ask them to create a sentence with the word. Encourage the student to expand their sentences as needed. Repeat for 5-10 sentences.

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7. Have the student **complete a semi-independent assignment** using speech recognition. In between sessions, provide students with an assignment to complete a writing piece (does not have to be a required academic assignment if they are not ready yet). Make sure someone is available to provide support as needed. This can be done at school or home (if SR is available to the student).

8. Have the student **complete an academic writing assignment** independently using the program. Use this sample and future writing samples to collect data.

   If speech recognition is effective as AT for writing, implement and monitor effectiveness and regular use over time.

Student's Guide for Speech Recognition

There are 4 steps to remember when writing with SR

1. Think it!  
2. Say it!  
3. Check it!  
4. Fix it!

1. Mentally compose your sentence  
2. Say your sentence clearly  
3. Check the speech recognition accuracy  
4. Fix any mistakes or delete & try again

Tips for using speech recognition for writing:
1. It will take time, practice, and patience to use SR efficiently  
2. Write key words and ideas on a graphic organizer before you start  
3. Try to find a place away from distractions  
4. Consider using ear buds with a mic or a noise-canceling headset mic  
5. After you turn on the mic, pause for 2 seconds before you speak  
6. Use clear, consistent speech  
7. Talk at a regular pace and volume, speaking word endings clearly  
8. Talk in longer phrases or whole sentences instead of word by word  
9. Do not chew gum while you are speaking  
10. Do not say "um" or make other sounds while you are speaking.  
11. Speak your punctuation (say "period" or "comma" or "exclamation point" or "question mark")  
12. Try not to look at the screen while dictating if that distracts you  
13. Turn off the microphone between sentences  
14. Use a text-to-speech feature for the "Check It" step to make sure you are reading the words on the screen accurately


Student's Guide for Speech Recognition

My speech recognition plan:

Today I worked with (include name, title and contact info if needed):

I used speech recognition on (list the device and specific app you tried):

I can find speech recognition on this tool by going to (list steps to find and open):

The type of assignments I will use speech recognition for are:

If I need a quiet place to use speech recognition, I will go to:

School: ___________________________ Home: ___________________________

When speech recognition is not an option, I could use other supports as needed:

Type of writing assignment: ___________________________ Tool: ___________________________

Type of writing assignment: ___________________________ Tool: ___________________________

Type of writing assignment: ___________________________ Tool: ___________________________

If I have any questions or need help, I can go to (include name and contact info):

Practice Tips

If I do not have an assignment to complete using speech recognition, I can do daily or weekly writing practice to work on my skills. Some ideas include:

- Write a story or day, write about a photo or video, complete a book review, compose an email.
- If I have a smartphone, I may consider getting extra practice by speaking my texts and emails (including punctuation).
Try it

Additional tips to share with the student throughout the session...

• Be Patient
• Don’t chew gum while you talk!
• Use ear buds with a mic or noise cancelling headphones if needed
• Try not to look at the screen while you are composing
• Pause after turning on the mic and pause after turning off the mic
• Speak in full phrases/sentences
• Talk at a regular pace and try to articulate your words and endings but do not over enunciate
• If needed, speak your ideas out loud first before turning on the mic
• Get in a comfortable position to optimize breath support
Recognize the limitations

Speech recognition will not **teach** a student to write!

- There's more to writing than transcription

Speaking is different from writing

- It takes time to learn how to speak in complete sentences
Questions?